

b.—PATHOLOGY OF THE NERVOUS SYSTEM AND MIND AND PATHOLOGICAL ANATOMY.

SYSTEMIC DISORDERS OF THE SPINAL CORD. Flechsig, *Archiv der Heilkunde*, XVIII., 288, 243, 1877; and XIX., 53, 1878. (Abstr. in *Revue des Sciences Médicales*.)

In the anatomical part of his memoir, Flechsig endeavors to give precisely the track of the pyramidal fibres, considered as forming a separate system as regards their functions, their origin, and their terminations. This chapter reproduces in part the results published by him in his work on the systematic description of the white substance of the nerve centres. Nevertheless, in carrying out his embryogenic researches, the author has modified his views regarding the higher origin of the pyramidal fibres. Formerly, he considered these fibres as terminating above in the central ganglia of the hemispheres, especially the lenticular nucleus.

At present Flechsig is convinced that the pyramidal fibres, which are the first to be provided with a medullary sheath in the embryo, do not have any connection with the central ganglia, but pass directly to the grey matter of the convolutions. If we follow their course from below upwards, we observe that at their exit from the pons, the pyramidal fibres pass in the third quarter of the lower portion of the peduncle (in going from without inwards). In the internal capsule, externally, they pass directly by the lenticular nucleus; internally they respond to the median portion of the optic thalamus, and more above to the nucleus caudatus, from which they are separated by a bundle of fibres going for the optic thalamus to the radiant crown. They penetrate into the centrum ovale at the level of the third posterior fourth of the nucleus caudatus, above the superior border of the lenticular nucleus. From this point they intermingle with foreign fibres in such a manner that their course cannot be followed far. It is, therefore, impossible to state precisely the parts of the grey cortex in which these fibres terminate.

The only thing that is certain is, that after their entry into the centrum ovale, these fibres spread out but very little, and that they preserve in great measure the direction that they took in the internal capsule; whence it may be presumed that they pass to the grey matter of the central convolutions and the frontal convolutions adjoining them.

The description of the intra-bulbar and intra-spinal track of these pyramidal fibres is only a repetition of that given by Flechsig in the work above cited. (See this journal for 1877, p. 360.)

Pathological Anatomy.—In the second part of his memoir, Flechsig engages in the demonstration that the secondary degenerations of the cord, consecutive to brain lesions, have their location in the pyramidal tracts, and that according to all appearances only the pyramidal fibres are involved to the exclusion of the foreign fibres intermingled with them.

The anatomico-pathological researches of Tuerck, Vulpian, and Charcot show that lesions of the grey cortex are not followed by secondary degenerations, unless they are situated in the grey matter of the central or the neighboring convolutions. The observations of Tuerck and Charcot show that the secondary degenerations of the pyramidal fibres are consecutive to lesions of the grey matter of the motor zone and the subjacent white substance. Moreover, the recent researches of Westphal have demonstrated that very superficial lesions of the grey substance, such as are found in progressive general paralysis, rather frequently give rise to secondary degenerations of the pyramidal bundles.

As to lesions involving the grey matter of the central ganglia of the hemispheres, the observations of Charcot have as yet not supplied the direct proofs that they can exist without giving rise to secondary degenerations. On the contrary, however, Tuerck has published the account of a case in which a *foyer* the size of a hazelnut existed in the caudate nucleus without any degeneration of the pyramidal fibres. In two other cases of Flechsig's, the external zone of the lenticular nucleus was destroyed and the pyramidal fibres were also intact. On his part Tuerck has reported two cases in which the upper portion of the optic thalamus was altered without secondary pyramidal fibre degenerations.

But we still lack direct proofs showing that lesions of the first and second members of the lenticular nucleus, the tails of the caudate nucleus and the lower posterior portion of the optic thalamus are incapable of producing this secondary degeneration.

Lesions of the internal capsule are those that most frequently give rise to secondary degenerations of the pyramids. Flechsig, however, considers as erroneous the opinion of Charcot that only those lesions that involve the two anterior thirds of the capsule can produce them. Thus in the two cases of Tuerck, mentioned above, the secondary degeneration involved the third posterior fourth of the internal capsule, and it is just at this horizon, according to Flechsig, that the pyramidal fibres coming from the cortex traverse the capsule. Moreover, in five observations of secondary degenerations of the pyramids that Flechsig himself reported, it was just this part that was involved.

In the cerebral peduncle the study of secondary degenerations is more complicated.

The study of the cerebrum of newly born individuals shows that the fibres extending from the peduncle to the internal capsule preserve their original relations in the latter. The fibres which are the most internal in the peduncle are the most anterior in the capsule, and *vice versa*.

Thus are explained the facts observed by Charcot and Vulpian: in case of lesion in the internal capsule, the more anterior it is in this tract, the nearer the secondary degeneration in the peduncle is to its internal border.

In the medulla and cord the degeneration always invades the pyramidal fibres as they have been described by Flechsig. The extent of the degeneration (as regards the number of fibres involved) depends on the dimension and locality of the primary lesion.

Indeed, at the horizon of the internal capsule, the section of the pyramidal

bundle presents a surface fifty times smaller than that of the cortical motor zone in which these fibres terminate. A lesion of the same extent would therefore entrain the degeneration of a greater number of fibres, when it involves the third posterior fourth of the internal capsule, than when it occupies the motor zone of the convolutions.

The distance from the side of the cord the degeneration extends in the anterior and lateral columns, and its extent in length present as many variations as does the distribution of the different bundles of the pyramidal fibres in this portion of their course.

When the degeneration occupies two homologous columns of the cord at the same time, it may be consecutive to a bilateral lesion of the hemispheres, or to a lesion involving the cord itself.

Secondary degenerations of the pyramidal fibres appear to have no reaction on the grey nuclei of the medulla and on the grey matter of the anterior horns.

From all this, Flechsig concludes that the secondary degeneration of the pyramids constitute rather a lesion of an elementary system of fibres.

In a last article, he defends his method of investigation, based on embryogenic researches and the anatomical results obtained with its use, against the attacks upon it by Mayser. To the results of Flechsig Mayser had opposed, in a recent article (*Arch. f. Psychiatrie*, VII.) the results obtained by him in experiments of vivisections of new-born animals.

PRIMARY DEGENERATIONS OF THE PYRAMIDAL BUNDLES.—In a third article Flechsig undertakes to study the localization and the precise nature of the lesions met with in the spinal disorder described by Professor Charcot under the name of amyotrophic lateral sclerosis.

I. The lesions of amyotrophic sclerosis are essentially a primary and symmetrical lateral sclerosis of the white lateral columns, a destructive atrophy of a great number of multipolar cells in the anterior horns, and a degeneration of a considerable number of the motor fibres of the anterior roots. But Flechsig endeavors solely to show that these different elements thus involved belong all to one system, which represents the most direct route of transmission connecting the cortical motor centres with the peripheral muscles.

a. Thus the lesions involving the white substance of the cord will not be limited to the lateral columns taken in their *ensemble*, as Charcot would have it. According to Flechsig, of all the cases of amyotrophic lateral sclerosis collected by M. Charcot, only six can be utilized in solving this question of localization.

But, in analyzing these six observations, the German author comes to the conclusion that the lesion of the white substance always reaches its greatest intensity at the horizon of the pyramidal bundles, as he understands them. (See above.) In the majority of cases one part (the smallest) of the pyramidal bundles passes along the anterior columns, while the other forms the posterior segment of the lateral columns. These are the place of election of the lesion in amyotrophic lateral sclerosis, only because they usually contain